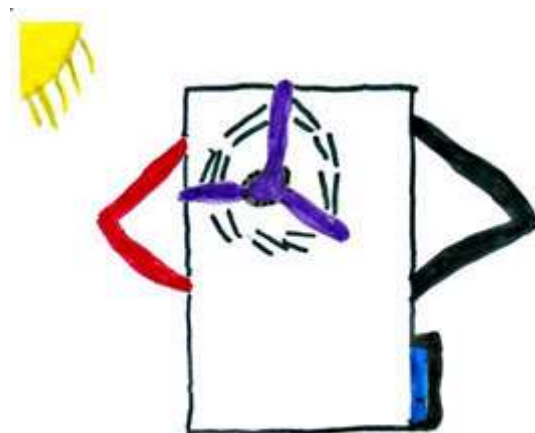


Energy and Sustainability

Name

Teacher

Form





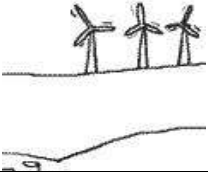
Energy and Sustainability

Assess your knowledge and understanding at different times during this section of the module. Use the following key

- Red: no knowledge or understanding
- Yellow: some knowledge or understanding – needs more work
- Green: confident in knowledge or understanding

My 6th Grade Target Level is My Current Level is

Outcome: I should be able to	Start	Middle	End
Describe what non-renewable means			
Describe what renewable means			
State whether an energy resource is renewable or non-renewable			
State an advantage of each energy resource			
State a disadvantage of each energy resource			
Name the three fossil fuels			
Describe why fossil fuels are called fossil fuels			
Describe how fossil fuels were formed			
Explain why fossil fuels are running out			
Describe what is meant by global warming			
Name the gases that cause global warming			
Describe the problems caused by global warming (climate change)			
Describe the evidence for global warming			
Describe how electricity is generated using fossil fuels			
Explain why different energy resources are used in different places			
State which energy resources use energy from the Sun			
Describe how energy from the Sun is used by certain energy resources			
State what sustainability means			
Evaluate the reliability of an energy resource, e.g. wind doesn't always blow			
List some ways of living sustainably			
Describe what a fuel is			
List at least three fuels			
Describe what problems burning fuels can create			
Label a diagram of the apparatus for the burning fuels experiment			
State the units for energy			
Work out how much energy is in food using the label on the packaging			
Identify independent and dependent variables in an experiment (HSW)			
Identify control variables in an experiment (HSW)			



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Identify anomalous results (HSW)			
Evaluate the reliability of results (HSW)			
Plot a bar graph (HSW)			
Write a valid conclusion based on evidence (HSW)			
Evaluate the precision of a measuring device (HSW)			



Fossil fuels

1. Name the three fossil fuels

.....

2. Why are they called fossil fuels?

.....

.....

3. Why do we need to conserve our supplies of fossil fuels? Give two reasons

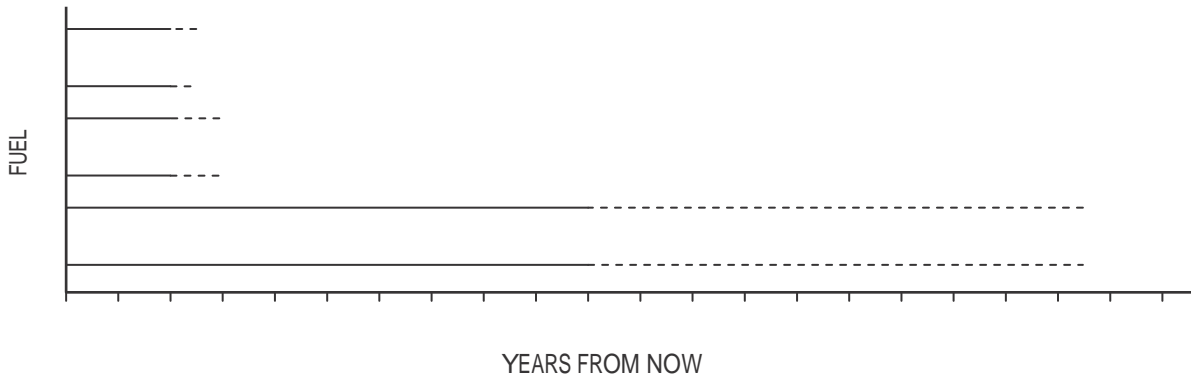
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4. Look at the bar chart. Color in the bars.

a) Coal – green, b) gas – blue c) oil - red



5. We are using up our fossil fuels too quickly. How long will they last if we carry on using them up at the same rate?

a) Coal

b) Oil.....

c) Gas.....



How fossil fuels were made

Arrange the cards your teacher has given you in the correct order to explain how coal, oil and gas were formed. Get your teacher to check them before you stick them in.

Coal

Oil and Gas



Global Warming and Climate Change



Global warming and climate change are two of the biggest problems that the human race faces today. You are going to watch a short video clip about these problems and then answer the questions below. Read the questions before you watch the video so you know what you need to remember.

1. What has happened to the Earth's average temperature over the last century?
.....
2. What is the name given to this increase in temperature?
.....
3. What gas, released when fossil fuels burn, contributes to global warming global warming?
.....
4. How do carbon dioxide and other greenhouse gases contribute to the greenhouse effect?
.....
.....
.....
5. What evidence do we have that global warming is happening?
.....
.....
.....
6. What effect could climate change have on
 - a) Polar ice caps and sea levels?
.....
.....
.....
 - b) Extreme weather conditions like hurricanes and droughts?
.....
.....
 - c) Endangered species of animals?



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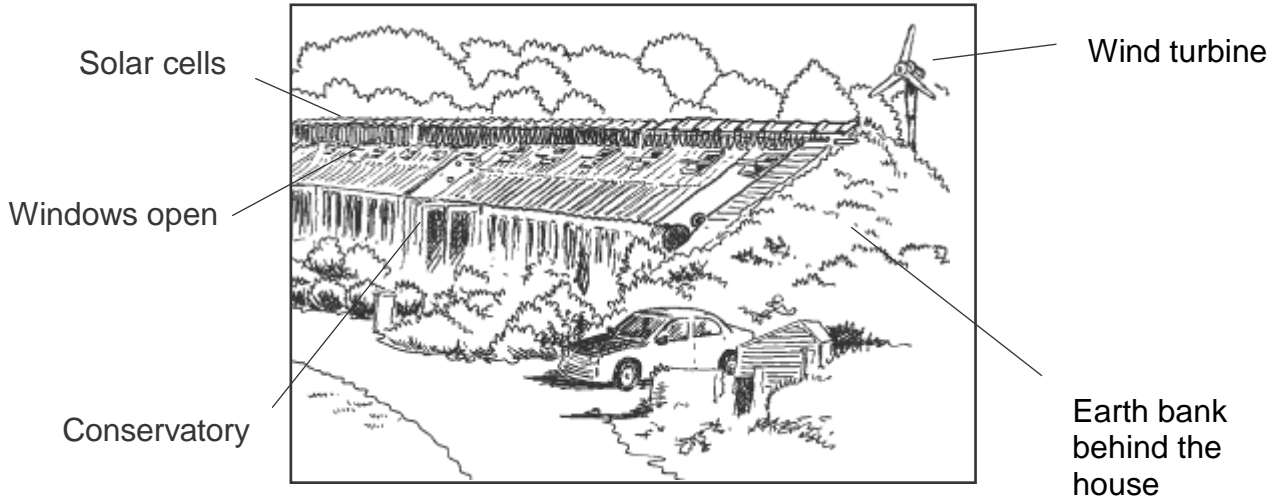
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Living at Hockerton

The drawing show parts of the houses at Hockerton in the UK.



1. Explain how each of the features labeled on the diagram helps people living at Hockerton to live sustainably.

- a) The solar cells
-
- b) The wind turbine
-
- c) The conservatory
-
- d) Keeping windows open in the summer
-
- e) The earth bank
-

2. What could you do at home to live more sustainably? Think of as many things as possible

.....

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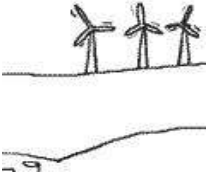


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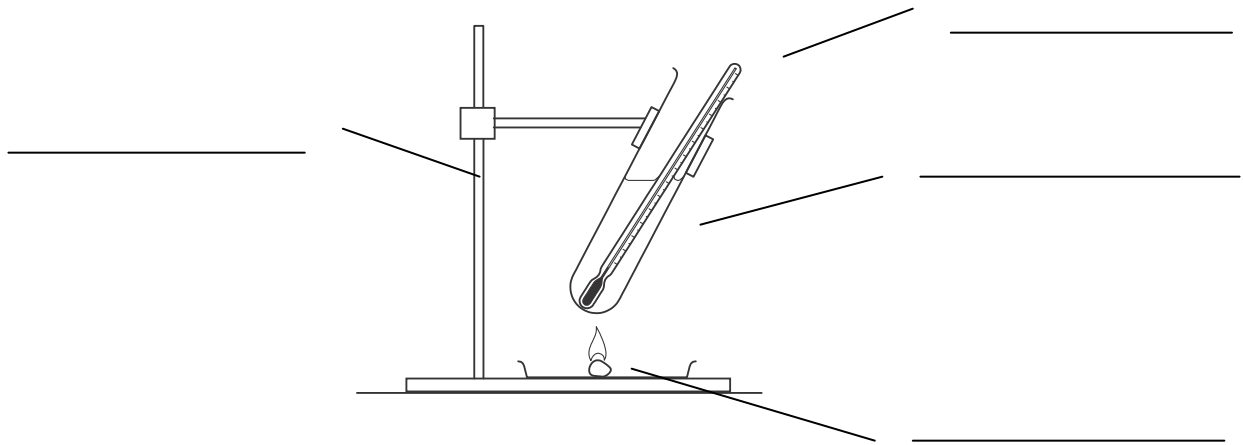
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Which fuel contains the most energy?

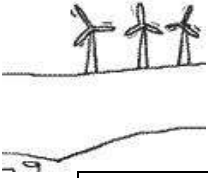
1. What is a fuel?.....
2. Give three examples of fuels
3. Label the diagram.



4. The independent variable is
5. The dependent variable is
6. Name two variables that we need to control in this experiment
 - 1.....
 - 2.....

Results

Fuel	Starting temperature of water ($^{\circ}\text{C}$)	Final temperature of water ($^{\circ}\text{C}$)	Temperature change ($^{\circ}\text{C}$)



7. What have you found out in your experiment?

.....
.....

8. Were there any control variables that you did not fully control? Explain your answer

.....
.....
.....

9. You could have improved the **reliability** of your experiment by repeating your experiment. What do you think this means?

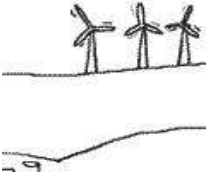
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Extension

10. Two pupils, Melissa and Liam, carried out a similar experiment. They burned 3 different fuels, repeated their experiment twice and then worked out an average temperature change. Here are their results.

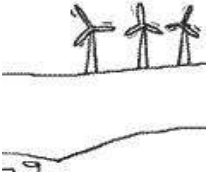
Fuel	Temperature change ($^{\circ}\text{C}$)			
	1	2	3	Average
wood	21.5	20.9	22.4	21.6
paraffin	25.2	16.0	24.8	22.0
candle wax	22.3	22.6	21.8	22.2

- a) Which result doesn't fit the trend (an anomalous result)? Put a circle around your answer.
- b) What should Melissa and Liam have done with this anomalous result?



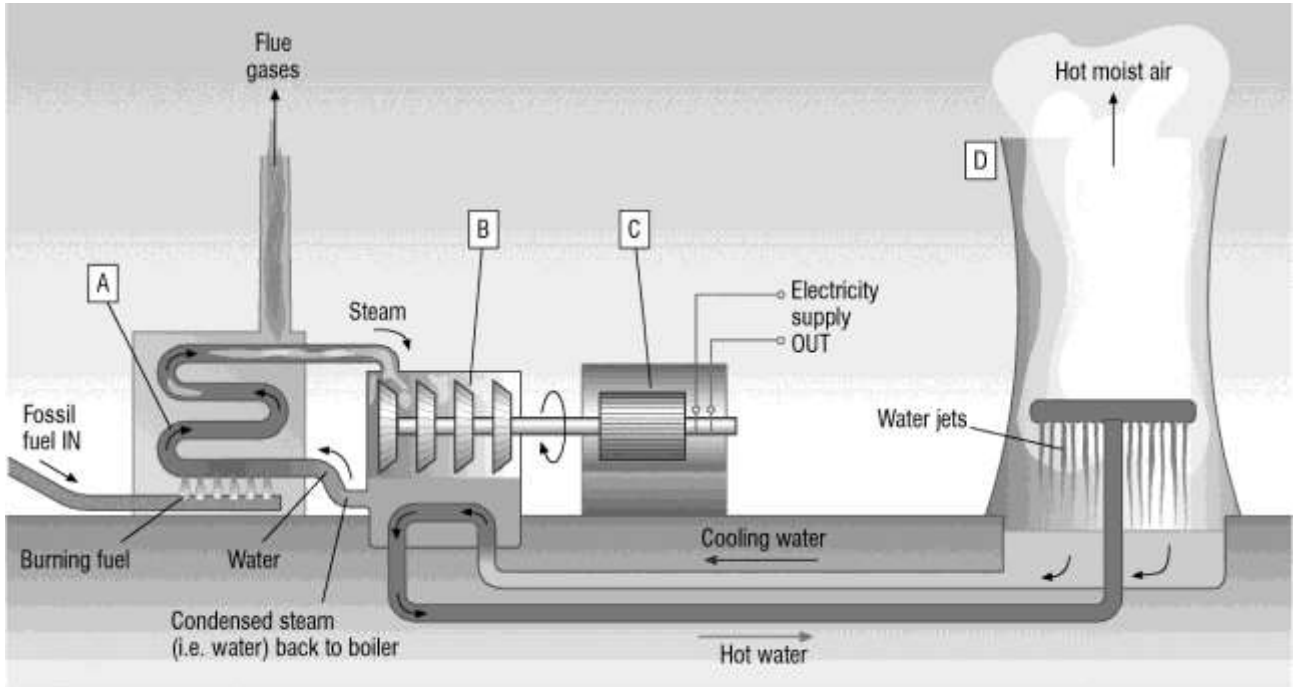
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c) How can you tell that they used a more precise thermometer than you did in their experiment?

.....
.....



Generating electricity using fossil fuels

The figure below shows the inside of a fossil-fuel power station.



1 Label the boxes A–D using the list of words 1–4 below.

- 1. Boiler
- 2. Cooling tower
- 3. Generator
- 4. Turbines

2 Describe how electricity is generated using fossil fuels. Use the key words **fuel, burn, heat, steam, turbine, generator** and **electricity**.

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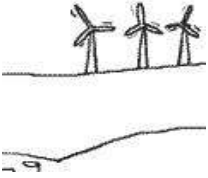


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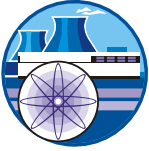




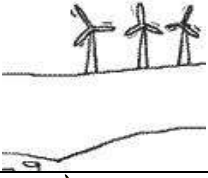
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Energy Resources Summary Sheet

Resource	Renewable (Y/N)	Location	Advantages	Disadvantages
 Fossil fuels			<ul style="list-style-type: none"> • Produce a lot of electricity • Reliable 	<ul style="list-style-type: none"> • Costs a lot to build the power stations • Produces carbon dioxide that contributes to global warming
 Nuclear			<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>
 Biomass			<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>
 Geothermal			<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>
			<p>.....</p> <p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p> <p>.....</p>



 <p>Solar</p>			<p>.....</p> <p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p> <p>.....</p>
 <p>Wind</p>			<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>
 <p>Waves</p>			<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>
 <p>Tides</p>			<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>
			<p>.....</p> <p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p> <p>.....</p>



Hydroelectric		
---------------	--	--	-------------------------	-------------------------



Choose your resource

AF2.3

Each renewable energy resource has its advantages and disadvantages. For instance, you can only use wind turbines when the weather is windy, but sometimes the wind is too strong and the turbine has to be stopped.

The people below want to use some renewable energy resources. They will still buy electricity, but if they can have one or two renewable energy resources their electricity bills will be lower.



Mr. McCloud lives in a small cottage on an island off the coast of Scotland. He lives near the sea, in a sheltered bay where the water is usually calm. He has built a wall around his garden to protect his plants from any strong winds.



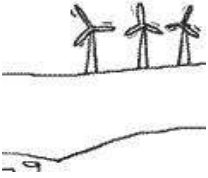
Mr. and Mrs. Singh live in a village in Hampshire, in the south of England. They like living there because the weather is warm.



Mrs. Williams runs a farm in Wales. She keeps lots of cows, which live indoors during the winter because the weather is very cold.



Mrs. Jensen owns an aluminum factory. It is built at the end of a sea loch in Scotland so that ships carrying the raw materials can reach the factory. There are high hills just behind the factory. She can spend a lot of money on her renewable energy resource, because it will save her a lot of money in the long run.



1 Decide which renewable energy resource each person should use, and explain why you have chosen that one. Some people might need more than one resource, but no one can have more than two.

Mr. McCloud

.....

.....

.....

.....

.....

.....

Mr. and Mrs. Singh

.....

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Mrs. Williams

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Mrs. Jensen



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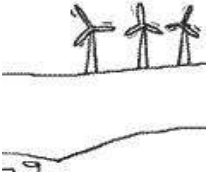
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The Source is the Sun

1. The original source of the majority of energy resources is the Sun. Circle those energy resources whose original source is the Sun.

fossil fuels

geothermal

wind

waves

biomass

solar

hydroelectric

tidal

2. Explain how energy from the Sun

a) gets into coal

.....
.....
.....
.....
.....

b) creates waves

.....
.....
.....

c) helps get water into reservoirs for hydroelectric power

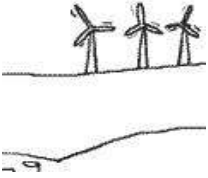
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.....
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d) gets into wood and other biomass fuels

.....
.....
.....

3. What is the source of energy for the two energy resources that do not use energy from the Sun?

.....
.....
.....



Energy in food

1. Look at the food labels below and then fill in the table

*Wholewheat
Breakfast Cereal*

Typical values	per 36g	per 100g
Energy	518 kJ	1440 kJ

Low-fat
Yogurt

Typical values	per pot	per 100g
Energy	235 kJ	196 kJ

**Raspberry
JAM**

TYPICAL VALUES		
	per serving	per 100g
Energy	158 kJ	1052 kJ

SAUSAGES

Typical values	per sausage	per 100g
Energy	601 kJ	1059 kJ

WHOLEMEAL BREAD

Typical values	per slice	per 100g
Energy	330 kJ	956 kJ

Butter

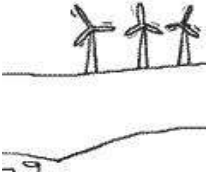
Typical values	per serving	per 100g
Energy	243 kJ	3046 kJ

Food	Energy per 100g (kJ)	Energy per serving (kJ)
Cereal		
Yogurt		
Jelly		
Sausages		
Bread		
Butter		

- What is energy measured in? (The unit of energy)
- Which food gives the most energy per 100g?
- Which food gives the most energy per serving?.....



5. How much energy would you get from a slice of bread and butter with jelly on it? Show your working
6. How much energy would you get from a sausage sandwich made from two sausages and buttered bread? Show your working.....
.....

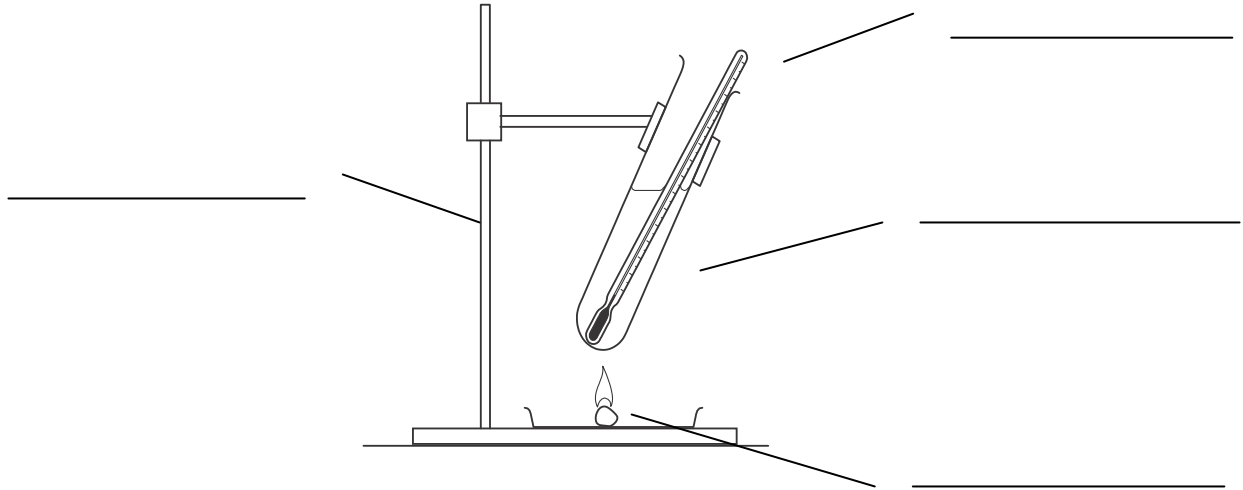


Which food contains the most energy?

1. Why is food classed as fuel?

.....

2. Label the diagram.



3. The independent variable is

4. The dependent variable is

5. Name two variables that we need to control in this experiment

1.....

2.....

Results

Food	Starting temperature of water ($^{\circ}\text{C}$)	Final temperature of water ($^{\circ}\text{C}$)	Temperature change ($^{\circ}\text{C}$)

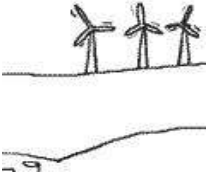
6. What have you found out in your experiment?



.....

.....

7. Plot a bar chart of your results and stick it in here.



8. Were there any control variables that you did not fully control? Explain your answer

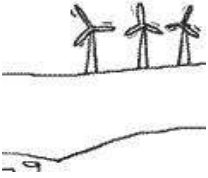
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9. How could you have improved the reliability of your results?

.....

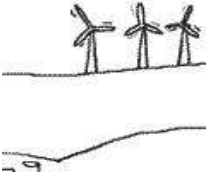
10. Using a digital thermometer improved the precision of your results. Explain why.

.....
.....



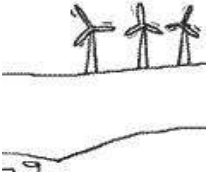
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